

CLAIMS

1. A method of coating an oxidized surface comprising:

5 reacting an active species having a general formula of  $AX_n$  with the oxidized surface to produce a bond between A and the oxidized surface and a new exposed surface having a reactive group; and

10 reacting a nucleophilic molecule having a general formula of  $DR^2$  with the reactive group to form a bond between the nucleophilic molecule and A;

wherein A may be any metal, semimetal, transition metal or ceramic;

wherein X may be any active group;

wherein  $DR^2$  is of the same chemical class as X;

15 wherein  $R^2$  includes an organic substituent not reactive with active group X; and

wherein  $R^2$  forms a coating.

20 2. The method of Claim 1 wherein the coating is hydrophobic.

25 3. The method of Claim 2 wherein the hydrophobic coating inhibits reactions of the underlying surface with water.

4. The method of Claim 1 further comprising modifying the coating.

5. The method of Claim 1, wherein the coating comprises a monolayer.

6. The method of Claim 1, wherein the oxidized  
5 surface is selected from the group consisting of: metals, semimetals, transition metals, ceramics, alloys thereof, and any combination thereof.

7. The method of Claim 1, further comprising A  
10 selected from the group consisting of: Si, Zr, Hf, Nb, Ti, Ta, Cu, Ag, and Al, binary compounds such as GaAs or InP, ternary or ore complicated compounds, and their oxides, and any combinations thereof.

15 8. The method of Claim 1, further comprising X selected from the group consisting of: esters, amides, organic acids, phenolates, thiolates, phosphonates, and any combinations thereof.

20 9. The method of Claim 1, further comprising DR<sup>2</sup> selected from the group consisting of: alcohols, amines, organic acids, such as carboxylic acid, phenols, thiols, phosphonic acids, and any combinations thereof.

25 10. The method of Claim 1, further comprising reacting the nucleophilic molecule with the reactive group at a temperature above the normal environmental temperature for the coating.

11. The method of Claim 1, wherein A comprises Si.

12. The method of Claim 11, wherein the active  
species comprises  $\text{Si}(\text{OCH}_2\text{CH}_3)_4$  and the nucleophile  
5 comprises an alcohol having a general formula of  $\text{OR}^2$ .

13. A method of coating an oxidized surface comprising:

5        reacting an active species having a general formula of  $AR^1_mX_n$  with the oxidized surface to produce a covalent bond between A and the oxidized surface and a new exposed surface having a reactive group; and

10        reacting a nucleophilic molecule having a general formula of  $DR^2$  with the reactive group to form a covalent bond between the nucleophilic molecule and A;

         wherein A may be any metal, semimetal, transition metal or metalloid;

         wherein X may be any active group;

15        wherein  $DR^2$  is of the same chemical class as X;

         wherein  $R^1$  includes an organic substituent non-reactive with the active group X;

         wherein  $R^2$  includes an organic substituent non-reactive with the active group X; and

20        wherein  $R^1$  and  $R^2$  form a coating.

14. The method of Claim 13 wherein the coating is hydrophobic.

25        15. The method of Claim 14 wherein the hydrophobic coating inhibits reactions of the underlying surface with water.

16. The method of Claim 13 further comprising modifying the coating.

17. The method of Claim 13, wherein the coating  
5 comprises a monolayer.

18. The method of Claim 13, wherein the oxidized surface is selected from the group consisting of: metals, semimetals, transition metals, ceramics, alloys thereof,  
10 and any combination thereof.

19. The method of Claim 13, further comprising A selected from the group consisting of: Si, Zr, Hf, Nb, Ti, Ta, Cu, Ag, and Al, binary compounds such as GaAs or  
15 InP, ternary or ore complicated compounds, and their oxides, and any combinations thereof.

20. The method of Claim 13, further comprising X selected from the group consisting of: esters, amides,  
20 organic acids, phenolates, thiolates, phosphonates, and any combinations thereof.

21. The method of Claim 13, further comprising DR<sup>2</sup> selected from the group consisting of: alcohols, amines,  
25 organic acids, such as carboxylic acid, phenols, thiols, phosphonic acids, and any combinations thereof.

22. The method of Claim 13, further comprising reacting the nucleophilic molecule with the reactive

group at a temperature above the normal environmental temperature for the coating.

23. The method of Claim 13, wherein A comprises Si.

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24. The method of Claim 23, wherein the active species comprises  $\text{Si}(\text{OCH}_2\text{CH}_3)_4$  and the nucleophile comprises an alcohol having a general formula of  $\text{OR}^2$ .

25. A method of coating an oxidized surface comprising:

reacting an active species having a general formula of  $\text{SiX}_n$  with the oxidized surface to produce a bond  
5 between Si and the oxidized surface and a new exposed surface having a reactive group; and

reacting a nucleophilic molecule having a general formula of  $\text{DR}^2$  with the reactive group to form a bond between the nucleophilic molecule and Si;

10 wherein X may be any active group;

wherein  $\text{DR}^2$  is of the same chemical class as X;

wherein  $\text{R}^2$  includes an organic substituent not reactive with active group X; and

wherein  $\text{R}^2$  forms a coating.

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26. The method of Claim 25, wherein the active species comprises  $\text{Si}(\text{OCH}_2\text{CH}_3)_4$  and the nucleophile comprises an alcohol having a general formula of  $\text{OR}^2$ .